Amendments to the Claims

The following listing of claims will replace all prior versions, and listings, of claims in this patent application:

1. (Currently amended) A machine-implemented method for constructing a roll function for use in designing transition curves for railroad tracks and other vehicle guideways, wherein the designing of the transition curves requires the roll function to be supplied and wherein the method comprises the steps of:

defining a set of basic roll functions; and

constructing the roll function as a linear combination of at least one of the basic roll functions while treating coefficients of an individual basic roll function as parameters of the roll function and considering the individual basic roll function to include a coefficient when the individual basic roll function is referred to without mention of the coefficient;

defining the roll function for shaping and superelevating said railroad tracks and other vehicle guideways.

2. (Currently amended) A method according to claim 1 wherein the roll function is used in a KS Method for designing a

transition shape and wherein the method further includes the steps of:

choosing a basic roll function which specifies a variation of guideway roll angle as a function of distance and of adjustable parameters;

causing centripetal and gravitational acceleration components in a plane defined by the guideway to be approximately equal at each point along a transition between two adjacent sections of the guideway by requiring curvature of alignment to approximately satisfy a balance equation;

determining a resulting transition curve alignment for given values of adjustable parameters by integrating the balance equation to obtain a compass bearing of the transition shape as a function of distance and by then integrating the cosine and the sine of the compass bearing to obtain respectively x and y coordinates of points along the transition shape, thereby defining a computed shape;

determining parameter values for which the computed shape connects with the two adjacent sections of the guideway; and

repeating integrations in each iteration of an iterative search.

3. (Currently amended) A method according to claim 1 which further includes the step of defining the basic roll functions via second derivatives of roll angle with respect to distance and in terms of standard Gegenbauer orthogonal polynomials $C_n^{\alpha}(x)$ by the formula

$$d^2 r(s)/ds^2 = j_n (a^2 - s^2)^m C_n^{(m+1/2)}(s/a)$$

where n is an integer ≥ 1, m is a real value ≥ 1.0, a is one half the length of the transition, s is a distance along the transition measured relative to a midpoint of the transition, $r(s)$ is the roll angle as a function of distance s, and j_n is a constant, and wherein the basic roll functions are not defined as a linear combination of a single basic roll function where $n = 1$ ~~2 wherein the causing of the equal centripetal and gravitational acceleration components to be equal and the determining of the resulting transition curve alignment for given values of adjustable parameters further includes a small angle simplification including the steps of replacing a cosine function by unity and replacing a sine function by an argument of the sine function in radians if the argument of the cosine function or the sine function is the roll angle or the compass bearing, so that the curvature of the shape is defined directly as the roll function times a position independent factor~~.

4. (Currently amended) A method according to claim 2 ~~any one of claims 1 to 3~~ which further includes the step of defining the basic roll functions via second derivatives of roll angle with respect to distance and in terms of standard Gegenbauer orthogonal polynomials $C_n^{\alpha}(x)$ by the formula

$$d^2 r(s)/ds^2 = j_n (a^2 - s^2)^m C_n^{(m+\frac{1}{2})}(s/a)$$

where n is an integer ≥ 1, m is a real value ≥ 1.0, a is one half the length of the transition, s is a distance along the transition measured relative to a midpoint of the transition, $r(s)$ is the roll angle as a function of distance s, and j_n is a constant, and wherein the basic roll functions are not defined as a linear combination of a single basic roll function where n = 1.

5. (Currently amended) A method according to claim 4 wherein m is a real value selected from the group of values consisting essentially of 1.0, 1.5, 2.0, 2.5 and 3.0.

6. (Original) A method according to any one of claims 1 to 5 for designing a generalized spiral transition and further comprising the step of choosing a linear combination of the basic roll functions that includes more than one basic roll function and so that a net change in roll angle over the length of the transition is non zero.

7. (Original) A method according to claim 6 which

further includes the step of adjusting the parameters of the generalized spiral so that the spiral connects from a straight section of the guideway to a curved section of the guideway, and after leaving the straight section, first moves away from the curved section and then reverses curvature to join the curved section, whereby the generalized spiral can be made longer than a traditional spiral without being restricted by a lack of adequate offset between neighboring guideway sections.

8. (Original) A method according to claim 6 which further includes the step of adjusting the parameters of the generalized spiral so that the spiral connects from one section of the guideway to another section of the guideway and so that compared to a corresponding simple spiral the shape of the generalized spiral lies closer to an existing guideway transition having an alignment requiring improvement.

9. (Original) A method according to claim 6 which further includes the step of adjusting the parameters of the generalized spiral so that the generalized spiral connects from one section of the guideway to another section of the guideway and so that the generalized spiral is shaped to avoid a local obstruction.

10. (Original) A method according to any one of claims

1 to 5 for designing a bend transition and further comprising the steps of:

choosing a linear combination of the basic roll functions that includes at least one of the basic roll functions and so that a net change in roll angle over the length of the transition is zero; and

choosing the basic roll functions so that the bend provides a transition between two sections of the guideway which are both straight and not parallel with each other.

11. (Original) A method according to any one of claims 1 to 5 for designing a bend transition and further comprising the steps of:

choosing a linear combination of the basic roll functions that includes at least one of the basic roll functions and so that a net change in roll angle over the length of the transition is zero; and

choosing the basic roll functions so that the bend provides a transition between two sections of the guideway which are both circular arcs of identical radius with distinct centers and so that a line through centers of the two sections of the

guideway is parallel to a line through two ends of the bend.

12. (Original) A method according to any one of claims 1 to 5 for designing a jog transition and further comprising the steps of:

choosing a linear combination of the basic roll functions that includes at least one of the basic roll functions and so that a net change in roll angle over the length of the transition is zero; and

choosing the basic roll functions so that the jog provides a transition between two sections of the guideway which are both straight and parallel but not collinear.

13. (Original) A method according to claim 12 which further includes the step of adjusting parameters of the jog so that the jog defines a shape of at least a majority of a length of a crossover between two sections of the guideway that run side-by-side in a two track configuration and that are both straight and parallel.

14. (Original) A method according to any one of claims 1 to 5 for designing a jog transition and further comprising the steps of:

choosing a linear combination of the basic roll functions that includes at least one of the basic roll functions and so that a net change in roll angle over the length of the transition is substantially zero; and

choosing the basic roll functions so that the jog provides a transition between two sections of the guideway which are both circular arcs of substantially identical radius and that are substantially concentric.

15. (Original) A method according to claim 14 which further includes the step of adjusting parameters of the jog so that the jog defines a shape of at least a majority of a length of a crossover between two sections of the guideway that run side-by-side in a two track configuration and that are both circular arcs with radii that are substantially equal.

16. (Original) A method according to any one of claims 1 to 5 for designing a wiggle transition and further comprising the steps of:

choosing a linear combination of the basic roll functions that includes at least one of the basic roll functions and so that a net change in roll angle over the length of the transition is zero; and

choosing the basic roll functions so that if one end of a resulting transition alignment connects to a particular straight line, then another end of the resulting transition alignment connects to a location on the same straight line, and so that the wiggle enables an otherwise straight section to circumvent a local obstacle.

17. (Original) A method according to any one of claims 1 to 5 for designing a wiggle transition and further comprising the steps of:

choosing a linear combination of the basic roll functions that includes at least one of the basic roll functions and so that a net change in roll angle over the length of the transition is zero; and

choosing the basic roll functions so that if one end of a resulting transition alignment connects to a particular arc, then another end of the resulting transition alignment connects to a location on the same arc, and so that the wiggle enables an otherwise uniformly curved section to circumvent a local obstacle.